

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device comprising a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

adding a catalytic element to a semiconductor film;

heating the semiconductor film to form a crystallized first region and a less crystallized second region than the first region;

irradiating first laser light to the first region to form a more crystallized third region than the first region;

irradiating second laser light to the second region to form a more crystallized fourth region than the second region; and

patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

wherein the first laser light has the same energy density from second laser light, and

wherein a scan speed of the first laser light is faster than that of the second laser light.

2. A method of manufacturing a semiconductor device comprising over a substrate a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

adding a catalytic element to a part of a semiconductor film;

heating the semiconductor film to form a first region in which a crystal grows in a parallel direction to the substrate and a less crystallized second region than the first region;

irradiating first laser light to the first region to form a more crystallized third region than the first region;

irradiating second laser light to the second region to form a more

crystallized fourth region than the second region; and

patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

wherein the first laser light has the same energy density from second laser light, and

wherein a scan speed of the first laser light is faster than that of the second laser light.

3. A method of manufacturing a semiconductor device comprising over a substrate a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

adding a catalytic element to a part a surface of a semiconductor film;

heating the semiconductor film to form a first region in which a crystal grows in a perpendicular direction to the substrate and a less crystallized second region than the first region;

irradiating first laser light to the first region to form a more crystallized third region than the first region;

irradiating second laser light to the second region to form a more crystallized fourth region than the second region; and

patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

wherein the first laser light has the same energy density from second laser light, and

wherein a scan speed of the first laser light is faster than that of the second laser light.

4. A method of manufacturing a semiconductor device according to claim 1, wherein a scan speed of the first laser light is over 20 cm/sec and less than 2000 cm/sec.

5. A method of manufacturing a semiconductor device according to claim 1, wherein a scan speed of the second laser light is more than 1 cm/sec and less than 20 cm/sec.

6. A method of manufacturing a semiconductor device according to claim 1, wherein each of the first laser light and the second laser light is a kind or a plurality of kinds selected from the group consisting of YAG laser, YVO₄ laser, YLF laser, YAlO₃ laser, glass laser, ruby laser, alexandrite laser, Ti : sapphire laser, and Y₂O₃ laser.

7. A method of manufacturing a semiconductor device according to claim 1, wherein each of the first laser light and the second laser light is emitted from continuous emission laser.

8. A method of manufacturing a semiconductor device according to claim 1, wherein each of the first laser light and the second laser light is second harmonic.

9. A method of manufacturing a semiconductor device according to claim 2, wherein a scan speed of the first laser light is over 20 cm/sec and less than 2000 cm/sec.

10. A method of manufacturing a semiconductor device according to claim 2, wherein a scan speed of the second laser light is more than 1 cm/sec and less than 20 cm/sec.

11. A method of manufacturing a semiconductor device according to claim 2, wherein each of the first laser light and the second laser light is a kind or a plurality of kinds selected from the group consisting of YAG laser, YVO₄ laser, YLF laser, YAlO₃ laser, glass laser, ruby laser, alexandrite laser, Ti : sapphire laser, and Y₂O₃ laser.

12. A method of manufacturing a semiconductor device according to claim 2, wherein each of the first laser light and the second laser light is emitted from continuous

emission laser.

13. A method of manufacturing a semiconductor device according to claim 2, wherein each of the first laser light and the second laser light is second harmonic.

14. A method of manufacturing a semiconductor device according to claim 3, wherein a scan speed of the first laser light is over 20 cm/sec and less than 2000 cm/sec.

15. A method of manufacturing a semiconductor device according to claim 3, wherein a scan speed of the second laser light is more than 1 cm/sec and less than 20 cm/sec.

16. A method of manufacturing a semiconductor device according to claim 3, wherein each of the first laser light and the second laser light is a kind or a plurality of kinds selected from the group consisting of YAG laser, YVO₄ laser, YLF laser, YAlO₃ laser, glass laser, ruby laser, alexandrite laser, Ti : sapphire laser, and Y₂O₃ laser.

17. A method of manufacturing a semiconductor device according to claim 3, wherein each of the first laser light and the second laser light is emitted from continuous emission laser.

18. A method of manufacturing a semiconductor device according to claim 3, wherein each of the first laser light and the second laser light is second harmonic.

19. A method of manufacturing a semiconductor device comprising a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

irradiating first laser light to a first region of a semiconductor film to form a more crystallized third region than the first region;

irradiating second laser light to a second region of the semiconductor

film which is different from the first region to form a more crystallized fourth region than the second region; and

 patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

 wherein energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$ and energy the first laser light gives to unit area per unit time is under $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$.

20. A method of manufacturing a semiconductor device comprising a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

 adding a catalytic element to a semiconductor film;

 heating the semiconductor film to form a crystallized first region and a less crystallized second region than the first region;

 irradiating first laser light to the first region to form a more crystallized third region than the first region;

 irradiating second laser light to the second region to form a more crystallized fourth region than the second region; and

 patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

 wherein energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$ and energy the first laser light gives to unit area per unit time is under $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$.

21. A method of manufacturing a semiconductor device comprising over a substrate a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

 adding a catalytic element to a part of a semiconductor film;

 heating the semiconductor film to form a first region in which a

crystal grows in a parallel direction to the substrate and a less crystallized second region than the first region;

irradiating first laser light to the first region to form a more crystallized third region than the first region;

irradiating second laser light to the second region to form a more crystallized fourth region than the second region; and

patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

wherein energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$ and energy the first laser light gives to unit area per unit time is under $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$.

22. A method of manufacturing a semiconductor device comprising over a substrate a p-channel TFT comprising a first island-shaped semiconductor film and an n-channel TFT comprising a second island-shaped semiconductor film, the method comprising:

adding a catalytic element to a part a surface of a semiconductor film;

heating the semiconductor film to form a first region in which a crystal grows in a perpendicular direction to the substrate and a less crystallized second region than the first region;

irradiating first laser light to the first region to form a more crystallized third region than the first region;

irradiating second laser light to the second region to form a more crystallized fourth region than the second region; and

patterning the third region and the fourth region to form the first island-shaped region and the second island-shaped region, respectively,

wherein energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$ and energy the first laser light gives to unit area per unit time is under $4.7 \times 10^{-9} \text{ W} \cdot \text{s}/\text{cm}^2$.

23. A method of manufacturing a semiconductor device according to claim 19, wherein the energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and less than $3.1 \times 10^{-8} \text{ W} \cdot \text{s/cm}^2$.

24. A method of manufacturing a semiconductor device according to claim 19, wherein the energy the first laser light gives to unit area per unit time is more than $2.2 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and under $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$.

25. A method of manufacturing a semiconductor device according to claim 20, wherein the energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and less than $3.1 \times 10^{-8} \text{ W} \cdot \text{s/cm}^2$.

26. A method of manufacturing a semiconductor device according to claim 20, wherein the energy the first laser light gives to unit area per unit time is more than $2.2 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and under $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$.

27. A method of manufacturing a semiconductor device according to claim 21, wherein the energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and less than $3.1 \times 10^{-8} \text{ W} \cdot \text{s/cm}^2$.

28. A method of manufacturing a semiconductor device according to claim 21, wherein the energy the first laser light gives to unit area per unit time is more than $2.2 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and under $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$.

29. A method of manufacturing a semiconductor device according to claim 22, wherein the energy that the second laser light gives to unit area per unit time is over than $4.7 \times 10^{-9} \text{ W} \cdot \text{s/cm}^2$ and less than $3.1 \times 10^{-8} \text{ W} \cdot \text{s/cm}^2$.

30. A method of manufacturing a semiconductor device according to claim 22, wherein the energy the first laser light gives to unit area per unit time is more than

2.2×10^{-9} W · s/cm² and under 4.7×10^{-9} W · s/cm².